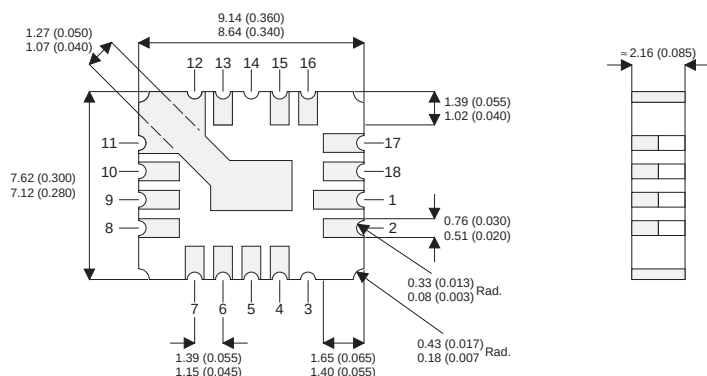


IP78M00A-LCC4 SERIES IP78M00-LCC4 SERIES

0.5 AMP POSITIVE VOLTAGE REGULATOR IN A CERAMIC SURFACE MOUNT PACKAGE



Pins 4,5 – V_{IN}
 6,7,8,9,10,11,12,13 – V_{OUT}
 Pins 15,16,17,18,1,2 – GND

FEATURES

- OUTPUT CURRENT UP TO 0.5A
- OUTPUT VOLTAGES OF 5, 12, 15V
- 0.01% / V LINE REGULATION
- 0.3% / A LOAD REGULATION
- THERMAL OVERLOAD PROTECTION
- SHORT CIRCUIT PROTECTION
- OUTPUT TRANSISTOR SOA PROTECTION
- 1% VOLTAGE TOLERANCE (–A VERSIONS)

DESCRIPTION

The IP78M00A series of voltage regulators are fixed output regulators intended for local, on-card voltage regulation. These devices are available in 5, 12, and 15 volt options and are capable of delivering in excess of 500mA over temperature.

The A-suffix devices are fully specified at 0.5A, provide 0.01% / V line regulation, 0.3% / A load regulation, and $\pm 1\%$ output voltage tolerance at room temperature. Protection features include safe operating area, current limiting and thermal shutdown.

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$ unless otherwise stated)

V_I	DC Input Voltage (for $V_O = 5, 12, 15\text{V}$)	35V
I_O	Output Current	Internally limited
P_D	Power Dissipation	Internally limited
T_J	Operating Junction Temperature Range	-55 to 150°C
T_{stg}	Storage Temperature	-65 to 150°C

ELECTRICAL CHARACTERISTICS

Parameter	Test Conditions	IP78M05A-LCC4			IP78M05-LCC4			Units
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V_O Output Voltage	$I_O = 100\text{mA}$ $V_{IN} = 10\text{V}$	4.95	5	5.05	4.8	5	5.2	V
	$I_O = 5\text{mA to } 350\text{mA}$ $P_D \leq P_{MAX}$ $V_{IN} = 7.5\text{V to } 20\text{V}$ $T_J = -55 \text{ to } 150^\circ\text{C}$	4.85		5.15	4.75		5.25	
ΔV_O Line Regulation	$I_O = 200\text{mA}$	$V_{IN} = 7\text{V to } 25\text{V}$		3	10		50	mV
		$V_{IN} = 8\text{V to } 25\text{V}$		3	10		25	
	$I_O = 500\text{mA}$		$V_{IN} = 8\text{V to } 12\text{V}$		3	10	50	
ΔV_O Load Regulation	$I_O = 5\text{mA to } 500\text{mA}$ $V_{IN} = 10\text{V}$ $T_J = -55 \text{ to } 150^\circ\text{C}$		5	50			50	mV
I_Q Quiescent Current	$V_{IN} = 10\text{V}$ $I_O = 350\text{mA}$ $T_J = -55 \text{ to } 150^\circ\text{C}$		4	6		4	6	mA
ΔI_Q Quiescent Current Change	$I_O = 5\text{mA to } 500\text{mA}$ $V_{IN} = 10\text{V}$ $T_J = -55 \text{ to } 150^\circ\text{C}$		0.1	0.5			0.5	mA
	$I_O = 200\text{mA}$ $V_{IN} = 8\text{V to } 25\text{V}$ $T_J = -55 \text{ to } 150^\circ\text{C}$		0.2	0.8			0.8	
V_N Output Noise Voltage	$f = 10\text{Hz to } 100\text{kHz}$		40	200		40	200	μV
$\frac{\Delta V_{IN}}{\Delta V_O}$ Ripple Rejection	$f = 120\text{Hz}$ $V_{IN} = 8\text{V to } 18\text{V}$	$I_O = 300\text{mA}$		65	80		62	dB
		$I_O = 100\text{mA}$ $T_J = -55 \text{ to } 150^\circ\text{C}$		65	80		62	
Dropout Voltage	$I_O = 350\text{mA}$		2	2.5			2.5	V
I_{SC} Short Circuit Current	$V_{IN} = 35\text{V}$		300	600		300	600	mA
I_{pk} Peak Output Current	$V_{IN} = 10\text{V}$	0.7	1.0	1.4	0.7	1.0	1.6	A
Average Temperature Coefficient of V_O	$I_O = 5\text{mA}$		0.5	2.0		0.5		$\text{mV}/^\circ\text{C}$
$R_{\theta JC}$ Thermal Resistance Junction to Case				13			13	$^\circ\text{C/W}$

1) All characteristics are measured with a capacitor across the input of 0.22 μF and a capacitor across the output of 0.1 μF .

All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques ($t_p \leq 10\text{ms}$, $\delta \leq 5\%$). Output voltage changes due to changes in internal temperature must be taken into account separately.

ELECTRICAL CHARACTERISTICS

Parameter	Test Conditions	IP78M12A-LCC4			IP78M12-LCC4			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V_O Output Voltage	$I_O = 100\text{mA}$ $V_{IN} = 19\text{V}$	11.88	12	12.12	11.50	12	12.50	V
	$I_O = 5\text{mA to } 350\text{mA}$ $P_D \leq P_{MAX}$ $V_{IN} = 14.8\text{V to } 27\text{V}$ $T_J = -55 \text{ to } 150^\circ\text{C}$	11.64		12.36	11.40		12.60	
ΔV_O Line Regulation	$I_O = 200\text{mA}$ $V_{IN} = 14.5\text{V to } 30\text{V}$		4	18			60	mV
			4	18			30	
	$I_O = 500\text{mA}$ $V_{IN} = 16\text{V to } 22\text{V}$		4	18			120	
ΔV_O Load Regulation	$I_O = 5\text{mA to } 500\text{mA}$ $V_{IN} = 19\text{V}$ $T_J = -55 \text{ to } 150^\circ\text{C}$		10	60			120	mV
I_Q Quiescent Current	$V_{IN} = 19\text{V}$ $I_O = 350\text{mA}$ $T_J = -55 \text{ to } 150^\circ\text{C}$		4	6		4	6	mA
ΔI_Q Quiescent Current Change	$I_O = 5\text{mA to } 500\text{mA}$ $V_{IN} = 19\text{V}$ $T_J = -55 \text{ to } 150^\circ\text{C}$		0.1	0.5			0.5	mA
	$I_O = 200\text{mA}$ $V_{IN} = 14.8\text{V to } 30\text{V}$ $T_J = -55 \text{ to } 150^\circ\text{C}$		0.2	0.8			0.8	
V_N Output Noise Voltage	$f = 10\text{Hz to } 100\text{kHz}$		75	480		75	480	μV
$\frac{\Delta V_{IN}}{\Delta V_O}$ Ripple Rejection	$f = 120\text{Hz}$ $V_{IN} = 15\text{V to } 25\text{V}$	$I_O = 300\text{mA}$	58	72	55			dB
		$I_O = 100\text{mA}$ $T_J = -55 \text{ to } 150^\circ\text{C}$	58	72	55			
Dropout Voltage	$I_O = 350\text{mA}$		2	2.5			2.5	V
I_{SC} Short Circuit Current	$V_{IN} = 35\text{V}$		300	600		300	600	mA
I_{pk} Peak Output Current	$V_{IN} = 19\text{V}$	0.7	1.0	1.4	0.7	1.0	1.6	A
Average Temperature Coefficient of V_O	$I_O = 5\text{mA}$		1.2	4.8		1.2		$\text{mV}/^\circ\text{C}$
$R_{\theta JC}$ Thermal Resistance Junction to Case				13			13	$^\circ\text{C/W}$

1) All characteristics are measured with a capacitor across the input of $0.22\mu\text{F}$ and a capacitor across the output of $0.1\mu\text{F}$.

All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques ($t_p \leq 10\text{ms}$, $\delta \leq 5\%$). Output voltage changes due to changes in internal temperature must be taken into account separately.

ELECTRICAL CHARACTERISTICS

Parameter	Test Conditions	IP78M15A-LCC4			IP78M15-LCC4			Units
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V_O Output Voltage	$I_O = 100\text{mA}$ $V_{IN} = 23\text{V}$	14.85	15	15.15	14.40	15	15.60	V
	$I_O = 5\text{mA to } 350\text{mA}$ $P_D \leq P_{MAX}$ $V_{IN} = 18\text{V to } 30\text{V}$ $T_J = -55 \text{ to } 150^\circ\text{C}$	14.55		15.45	14.25		15.75	
ΔV_O Line Regulation	$I_O = 200\text{mA}$	$V_{IN} = 17.5\text{V to } 30\text{V}$		4	22		60	mV
		$V_{IN} = 20\text{V to } 30\text{V}$		4	22		30	
	$I_O = 500\text{mA}$		$V_{IN} = 20\text{V to } 26\text{V}$		4	22	150	
ΔV_O Load Regulation	$I_O = 5\text{mA to } 500\text{mA}$ $V_{IN} = 23\text{V}$ $T_J = -55 \text{ to } 150^\circ\text{C}$		12	75			150	mV
I_Q Quiescent Current	$V_{IN} = 23\text{V}$ $I_O = 350\text{mA}$ $T_J = -55 \text{ to } 150^\circ\text{C}$		4	6		4	6	mA
ΔI_Q Quiescent Current Change	$I_O = 5\text{mA to } 500\text{mA}$ $V_{IN} = 23\text{V}$ $T_J = -55 \text{ to } 150^\circ\text{C}$		0.1	0.5			0.5	mA
	$I_O = 200\text{mA}$ $V_{IN} = 18\text{V to } 30\text{V}$ $T_J = -55 \text{ to } 150^\circ\text{C}$		0.2	0.8			0.8	
V_N Output Noise Voltage	$f = 10\text{Hz to } 100\text{kHz}$		90	600		90	600	μV
$\frac{\Delta V_{IN}}{\Delta V_O}$ Ripple Rejection	$f = 120\text{Hz}$ $I_O = 300\text{mA}$	57	70		54			dB
	$V_{IN} = 18.5\text{V to } 28.5\text{V}$ $I_O = 100\text{mA}$ $T_J = -55 \text{ to } 150^\circ\text{C}$	57	70		54			
Dropout Voltage	$I_O = 350\text{mA}$		2	2.5			2.5	V
I_{SC} Short Circuit Current	$V_{IN} = 35\text{V}$		300	600		300	600	mA
I_{pk} Peak Output Current	$V_{IN} = 23\text{V}$	0.7	1.0	1.4	0.7	1.0	1.6	A
Average Temperature Coefficient of V_O	$I_O = 5\text{mA}$		1.5	6.0		1.5		$\text{mV}/^\circ\text{C}$
$R_{\theta JC}$ Thermal Resistance Junction to Case				13			13	$^\circ\text{C/W}$

1) All characteristics are measured with a capacitor across the input of $0.22\mu\text{F}$ and a capacitor across the output of $0.1\mu\text{F}$.

All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques ($t_p \leq 10\text{ms}$, $\delta \leq 5\%$). Output voltage changes due to changes in internal temperature must be taken into account separately.